

MC.0356

Interviews of the Margaret MacVicar Memorial AMITA Oral History Project

Pauline Austin – Class of 1942

(interviewed by Lori Fujitake)

October 7, 1996

This is the interview of Pauline Austin. Today's date is October 7th, 1996. It's approximately 3:30 p.m. We're in Building 54-1818, in her office. This interview is for the Women's Oral History Project. It is working to record the histories of women at MIT, and also, the history of women in science.

LF: I know you've had a long and interesting life. Maybe you would want to start out by talking about your early life.

PA: Well, my early life was in Mexico, about a hundred miles west of Mexico City, at least after the age of six. We had lived in a suburb of Mexico City before then. My parents were educational missionaries. My father had an agricultural school for young men, but it was elementary grades. In those days (it was the 1920's), Mexico did not have a public school system, so in order for the men from small villages and towns to have any education, they had to go away from home to school. The mission had this school where they could come and live and learn agricultural things as well as reading and numbers. Basically, my childhood was very isolated. I never went to school formally. There was another mission family in the same town, and at first my mother and Mrs. Ross taught my brother and me and the Ross children. I had a sister, too, but she was older and had already gone off to boarding school. Then, an aunt of mine, a sister of my mother's, and her husband came down. He was a civil engineer from Georgia Tech. Actually, the only technological school that I had ever heard about before college was Georgia Tech. My mother was from Atlanta and had a number of sisters, and most of them were courted by engineers from Georgia Tech. Anyway, my aunt (my mother too, actually) had been a school teacher before she married, and she set up a little school for six of us, my brother and me and her son and three children from the other mission family. She received educational material from a cousin of hers and my mother's who was principal of a school in Atlanta. The year that I was eleven we were in the U.S., as my mother had to have

some medical work done. That year I lived with another cousin of hers and attended that school in Atlanta.

LF: So between the ages of six and eleven you were in Mexico, then?

PA: Yes, I was just in the U.S. for one year.

LF: And then you went back to Mexico?

PA: And then I went back; I went to school half of the sixth grade and half of the seventh grade while I was in the U.S. that year.

LF: I want to talk about your life in Mexico, those early years, first. Did you speak Spanish?

PA: In the family, we spoke English; we were Americans. Of course, yes, I spoke Spanish, too; I was brought up bilingual.

LF: Did you have a lot of Mexican friends:

PA: Not really, because my father's school was an agricultural school, so it was out from the town. The young men at the school, although it was an elementary school, were (most of them) between the ages of 15 and 20, because of not having any schools where they lived. That's why I said my childhood was relatively isolated. My playmates were basically my brother and the children from the other mission family who came out to go to school with us.

LF: Was it a big transition when you went to Atlanta for a year and went to regular school, in terms of socializing and education?

PA: I never was very good at socializing. My aunt was a good teacher and I had no difficulty at all academically.

LF: What was her educational background?

PA: Well, she was brought up in Atlanta, went to the Atlanta public schools. In those days, you know, young women, including my mother and my aunt, often went directly to teaching school right out of high school. Their father died relatively early, and they had to help support the family. My mother was only sixteen or seventeen when she started teaching school. My aunt's educational background was essentially just through high school, but she had done a lot of reading and studying and was a good teacher. As I said, my mother's cousin was principal of a school in Atlanta and could send down materials.

LF: Did you notice the way you were educated when you came to the United States and went to a "normal" type of school--was it a lot different than how your aunt schooled you?

PA: Well, it was different in the sense that there was a whole classroom in the same grade, because of course, all six of us at home were in different grades, so it was almost like individual tutoring. My sister and my brother had both gone on to boarding school at the age of twelve, but my family allowed me to stay at home until I was fourteen because I was the youngest. That was through my freshman year in high school. I went to that same boarding school in Atlanta for sophomore year. Again, I was not good at socializing at all because I had had so little social life. I was not unfriendly, nor were people unfriendly to me, but I didn't know how to be at all outgoing. I was homesick, too, while boarding at

the school. It was a very small boarding department. I was the only sophomore there and was rooming with two juniors, which didn't make it all that social. When I went home the next summer, my parents asked if I'd like to stay home another year; and I took them up on it very quickly. So I did my junior work at home, also, and went back to Atlanta for my senior year. Then, I was a little more knowledgeable about what to expect, and it was not quite such an agonizing and homesick year. My brother, meanwhile, had gone to Davidson College in North Carolina, and he wanted to go to medical school. My father could not afford to send me to college and my brother to medical school at the same time. He said that I could have a choice of going home, getting a job, getting a scholarship. So my mother wrote to the board of missions and asked them about possibilities for scholarships. One of the things they told her was about Wilson College in Chambersburg, Pennsylvania. Everyone I knew was from the South; Pennsylvania seemed like a foreign country. But they had some very good scholarships that gave full room, board, and tuition, and they gave some preference to daughters of missionaries and ministers. So, I took the College Boards and applied and was accepted; thus I went off to Wilson College in Pennsylvania having never even been there before.

LF: What year was this?

PA: This was 1934 when I graduated from high school.

LF: So that was before a lot of the colleges had opened up to women, right?

PA: Well, it was an all-women's college. It wasn't until the 1960's that most colleges were opening up to women. It was very interesting, because it was a small college. There were between 300 and 400 students altogether, only about 90 in our class, but it had a very good reputation. In those days women who were scholars did not have many professional

opportunities, except to teach in a women's college. Some of the women we had teaching us were excellent scholars. There, I really, truly began to make friends. I was fortunate to be placed to room with a girl from Scranton, Pennsylvania, who was almost as unsophisticated as I was. We became very good friends, and we made other good friends there. I was planning to major in math.

LF: Why were you planning to major in math?

PA: Well, I liked math. I was always good in arithmetic. My father actually, before he went down to Mexico, was an instructor in math at Georgia Tech, so I guess I came by that naturally. We had to take a variety of courses, and my sophomore year I took both chemistry and physics for a science requirement. I had not been in the physics class more than about a week or two when I really recognized it as something that I really, really liked; so I decided that was what I wanted.

LF: What do you feel that it was about physics exactly? Do you know, if you could put into words, what it set off in you that made you like it so much?

PA: No, except that I was fortunate that my professor was an excellent person. The combination of having an excellent teacher and a field that to me, still, is basically interesting, is what did it. She was Miss Dorothy Weeks, Dr. Dorothy Weeks, who I believe was the first woman to receive a Ph.D. in math at MIT. During World War I, she was an instructor, here, at MIT. She believed that MIT was the greatest place that you can imagine. Actually, that was the first I had heard of MIT. When I mentioned it at home, my uncle, the one that was from Georgia Tech, still called it Boston Tech, its original name. I told Dr. Weeks that I really wanted to major in physics. She did not recommend it because she said that if a person was interested in graduate work, it would not be to their advantage

to have majored in a department where there was only one faculty member. You can imagine, in a small college for women, how many, or how few, people were taking physics. In these days, someone like Dorothy Weeks would not have ended up at a small college like that, she would have had broader opportunities. "No way," I said, "I don't have any money, my family doesn't have any money." She said, "Well, don't you worry about that, you just do your studies and we'll take care of things as they come along." So I majored in math and minored in physics.

One of the requirements of the scholarship that I had was to take two years of Latin, two years of Greek and a year of Hebrew. Apparently this requirement was to honor the wife of the man who donated the scholarships. She was a classics scholar. Well, by the time I majored in math and minored in physics and took the distribution courses and the scholarship requirements, my electives were down to zero. I had taken four years of Latin in high school and enjoyed it and found it relatively easy because of my Spanish. In fact, I entered a couple of statewide contests in Georgia the two years I was there and won a silver medal one year and the gold medal the other. So I enjoyed the Latin and Greek; the Hebrew sort of went in one ear and out the other. Anyway, Miss Weeks encouraged me about graduate work and insisted that MIT was the place to go. Wilson college had some graduate fellowships, but you couldn't get one the first year that you were out, it had to be at least the second one. She helped me to apply to various places; I got a full fellowship at Smith College, so I went there and did a Master's degree in physics.

LF: One thing I wanted to ask you before we move on to Smith is, when you were studying at Wilson College, were there a lot of other women studying math, too? Or was that also a field where there were few people?

PA: Well, it was a pretty small group, yes. Actually, one of my classmates was majoring in physics, but as I said, Miss Weeks discouraged me from it, because she saw someone

who might be interested in graduate school. There were not more than two or three of us majoring in math. We had a rather odd soul teaching in the math department; the head of the math department was a very lovely woman, but her associate was the sort of difficult, absent-minded professor type. In calculus class--in those days you never had things like calculus in high school, trig was usually what you took first year in college and you took calculus sophomore year. In calculus class she used to turn her back on the class and fill the blackboard with lines of equations and things, and, after class, half of the class would come around to my room and say, "Pauline, what did Dr. Johnson say?"

LF: So you felt it was a smooth transition going from your high school years to your college years?

PA: It was good because it was a small college for women. It was a very good place for a person like me because, as I say, socially I was very naive and immature.

LF: What about academically?

PA: Academically, I had no problem at all. Wilson College was, and is, a very good college in spite of its small size; I had no problem, as you can see, getting fellowships to go on ahead. The year after I was at Smith, I was able to get a Wilson graduate fellowship for the grand sum of \$600 which covered all of my expenses except tuition, while MIT gave me tuition scholarships.

LF: So did they have a big program in graduate study in Physics for women?

PA: At Smith?

LF: Yes.

PA: Not big, there was one other graduate student and several undergraduate students at the time that I was there. Smith College had a graduate house and it was just an ordinary domestic, home-type building, but a fairly big one. I don't remember just how many people were in there, maybe fifteen or twenty of us, but that covered a number of departments.

LF: So it was very small?

PA: Yes, our graduate department was not large and the physics department was quite small. There were just two of us in the graduate house taking graduate work in physics.

LF: Did you maintain your relationship with Miss Weeks throughout your graduate studies?

PA: Oh yes, I kept in touch with her for many years, long after she helped me get scholarships to MIT. She had done her undergraduate work at Wellesley--took physics there, then went on to graduate work at MIT. After she retired from Wilson, she came back to this area and lived in Wellesley for quite a while. She did some work with the Watertown Arsenal and also at Harvard, and I did indeed keep in touch with her until she died many years later in her nineties. She was a very good friend and mentor for many years for me. Then, in 1939, I came to MIT as a graduate student and there were four women in the physics department, graduate students, which was practically unheard of; they couldn't believe that there were four of us all at once.

LF: MIT couldn't believe? Or the Professors? Or everyone couldn't believe it?

PA: It was just unusual to have four women graduate students in physics at the same time. I did not take too many courses with the other women; I didn't particularly keep in touch with them as time went on.

LF: So it seems that there was a big difference between moving from Smith and Wilson to MIT--where there were suddenly men studying with you. How did you feel about that transition? Was it easy? Was it hard?

PA: It was not difficult, so far as it being mainly men. As I say, I was truly fascinated with the studies, with the coursework I was taking, and people, the faculty, were very nice to women. I don't know how they are now at MIT, but, in those days, they were very kind, and, also, there was a professor here who was a very good friend of Miss Weeks. He actually had four, five, I think, daughters, and the other professors used to kid him and call him the dean of women because he was especially kind to the women students. He was in the physics department, so he sort of kept an eye out to see that everything was going all right with me. No, I didn't have any particular problems. I didn't suddenly leap into a social life or anything like that, but everybody was nice and friendly and talked to me, and there was no difficulty. I did even get brave and try out for Dramashop, for which I have zero talent, but they had so few women, they would snap anybody up, so I got a little bit of experience in Dramashop. I also tried the sailing school once, having never lived near anywhere where there was water or sailing. They sat us down and made us tie knots for so long that I got totally discouraged and never made it to a boat. But, then, several years later, there was a girl in one of my classes who was a keen sailor. One Friday she said to me, "Oh Polly, the women's Intercollegiate Regatta is on the Charles River this Saturday and the girl who is my crew is sick. Will you crew for me?" I said, "Domina, I don't know the first thing about sailing." She said, "Never mind, I'll tell you

what to do, and all you have to do is do it quick." So, I agreed, "If you're that desperate..." Anyway, she was, indeed, a good sailor, and I did what she told me quickly and we won three out of four races. The captain got a cup and the crew got a cup so I went home with a cup that says "Women's Intercollegiate Regatta," and I still know nothing about sailing. In fact, a number of years later, in 1953 to '55, I was a lecturer in physics at Wellesley. In one class I was trying to teach something about vectors, and I thought, "Sailing is great; you have your keel going one way and your sail another and your wind going in another direction and you need to sort them all out." So we went through all of this with great care. After the class was over, one of the girls said, "Mrs. Austin, did you ever sail a boat?" I said, "No, not really." She said, "You know, it isn't like that at all." I guess the practice and the theory are not always the same.

LF: So let's go back to MIT and your graduate study and how your career developed.

PA: Even when I was a child in Mexico, I was interested in astronomy, primarily the constellations. I took some astronomy at Wilson and when I came here to MIT. I was especially interested in cosmic rays. And it so turned out that the Professor in charge of cosmic rays, Manuel Vallarta, was a Mexican. He came from the University of Mexico, and that was pure coincidence, but anyway, he was very kind and put me in an office with his graduate students. I had expected to work in that field, but then the war interfered. In the work with cosmic rays they would track them with the differential analyzer,. That was the original digital computer. It was a huge room filled with vacuum tubes, and goodness knows what all else. Well, just about the time I was ready to think about doing a thesis, they said that the differential analyzer couldn't be used for any subjects except defense work.

LF: So you were working on a project that involved defense work, I assume?

PA: Well, I couldn't work on cosmic rays because it wasn't defense work and I couldn't get access to the differential analyzer. So Professor Stratton, who was then Professor of Electromagnetic Theory, asked if I would like to do a thesis in Electromagnetic Theory, instead. At that time, they were setting up the Radiation Laboratory for research on radar. You know the radar was invented in England, but they were so hard pressed during the battle of Britain that all of the research to develop it was brought over here to MIT, and Professor Stratton was very much involved in that. I did a thesis with him in Electromagnetic Theory. I finished that in 1942 and went directly into the Radiation Lab doing defense work on radar.

LF: So your interests kind of changed...?

PA: Well, it was changed by circumstances. It changed even further because, meanwhile, I had met and dated and become engaged and married and my husband was in meteorology. He actually came from New Zealand, originally, and was two years in Samoa with the Meteorological Observatory there and decided he wanted to do graduate work in meteorology. He had taken applied math at the University of New Zealand. The New Zealand Meteorological Service recommended MIT, so he came here as a graduate student and got his degree in 1941. That was when we were married--in June of '41. He was then offered a position on the faculty. At that time MIT's meteorology department had very large classes of Air Force and Navy students training for weather officers. He joined the Meteorology Faculty and continued there until he retired. I went into the Radiation Lab. At first I was working with the LORAN Navigation group; that unit was most connected with what I had been doing with Professor Stratton. In later years when I got to know Stratton better and more personally, I said to him (he was then President of MIT), "You know Professor Stratton, I gained in prestige just by sitting around and having been one of

your students." I went into the Radiation Lab with the LORAN group and not very long after that, I took a leave of absence for the birth of my first daughter. When I went back to the Radiation Lab after that, it turned out that the whole LORAN section had been transferred to England. Then, I was put in the antenna group and that was more directly connected with radar. I worked there until my second daughter was due and I took another leave of absence. At that time, the war ended, and the lab closed down. So I was a little bit at loose ends. One day my husband came home and told me that they were setting up a project in the meteorology department to study storms with the radar. And he said, "That sounds like something that would be very interesting to you," which of course it was, because it combined his field with what I had been doing. So, I came over and learned about the project, applied, and they took me on.

I was very fortunate in those days to be able to work part time because in the times of the war effort, research scientists were so badly needed. Similarly during World War I my very good friend and Professor, Dorothy Weeks, was taken on as an instructor here at MIT, a position given only to men in those days. And in the second war, they wanted to know, even before I got my degree--the summer I was married, and still hadn't written my thesis--they were interested in hiring me. I hadn't planned to work that summer; I came over to the physics department just to say hello to people and Professor Stratton said, "Are you looking for a job?" I said, "No, but if one was thrust at me, I would think about it." He said, "How many hours a week can you work?!" And I found the same attitude in the Radiation Lab; they were so anxious to have somebody that the fact I was only able to work part-time (Well, I worked full time for a short while before the first baby was born) was okay with them. The same thing happened when I came over and applied for the Weather Radar Project. There was a meeting in the Department of Meteorology to plan the project including people from MIT and from the Army Signal Corps (the sponsor), and I was there as a listener to learn about the project. They decided that the Signal Corps was going to provide the radars and the money and MIT was going to provide the space and the

personnel. They seemed to have it all squared away, when somebody said, "How about electromagnetic theory?" It was then agreed that they'd need a full-time man on electromagnetic theory. So, I spoke up, "Would you consider a half-time woman?" They thought that would be good because it was only half as expensive, and I went on to the project at its inception in 1946. Actually, it turned out that the electromagnetic theory was very far ahead of either the radar measurements or the meteorological interpretations, and the amount of electromagnetic theory I have done over the years could be put in a teaspoon, I think, because all of the work mostly involved trying to get some decent measurements and to find out what they're telling us about the storms. Nowadays, you see the weather on TV, showing storms coming and going with their intensity shown in colors. Well, all of that was not possible then (laughter). All we had was a gray smudge on a black screen. We were one of the first two projects (there was a project here, and one at McGill University in Montreal set up to study weather radar). Then very soon one was set up at the University of Illinois. Those were the places where the weather radar really began, and it was very interesting.

LF: I wanted to ask you--you brought up your daughters being born and how you worked part-time after that--before you had your children were you concerned about your career and being able to have children, or did you just let things happen?

PA: Well, in a way I was concerned even before I got married because in those days, very few married women worked. I didn't envision what kind of career or profession I was looking for--which is not surprising because most women who did anything at all in science would be teaching and very few of them were married.

LF: Because of the nature of the jobs...?

PA: Well, yes, because society expected a woman to go home and keep the house and the family and that was that. And maybe one reason I didn't mind having not too much social life was that I was not keen on marriage, per se, because I was finding my way in this wonderful, interesting, exciting world of physics. But I did meet my husband and we became very fond of each other, and I realized that he was not going to stand in the way of what I wanted to do. So I didn't really plan one way or the other; I just sort of took things as they came. I assumed that I was not going to be going home and doing nothing because that isn't my thing, but I also assumed that I wasn't going to go forever without any family life either. In fact, it is my belief that the whole women's movement has not sufficiently emphasized the possibilities of having a good professional life and a good home life. In other words, you can build a decent professional life without being full-time or sixty hours a week or whatever. And if you don't break through a glass ceiling, so what--you can still have a good life. But, as I say, there didn't seem to be any particular resentment, professionally, from the men because of the fact that I was a woman doing these things; I was about the only one in weather radar early on. We'd go to the meetings, the weather radar conferences, and, for a while, I was the only woman there. Then one or two others filtered in.

LF: So you didn't feel that that strongly affected your professional interaction with the men--the fact that you were a woman?

PA: No, I don't think so, but I have been, as I say, in the academic world. I started here at MIT, and I took those two years over at Wellesley, but of course, no one is going to resent your being a woman there. It is true that, before I went to Wellesley, I went around to several universities here, in the area, looking to see if they had any teaching positions. I had been in weather radar for a while, starting in 1946, and that was about 1952. I

thought, you know, that my experience was very limited, and I should try to spread out a little.

LF: So you thought you should try to teach?

PA: Yes, so I went around. And at one or two places they said, no, in applied math or physics all of our students are men, we wouldn't want to hire a woman. So, I didn't get very far with that. Then, suddenly, Wellesley called me back and asked if I would consider taking a leave of absence from MIT and going there temporarily because they had a woman in their physics department who wanted to come here and complete her Ph.D. That suited me very well because I was not keen on burning bridges, either. So, I was over there for three semesters while she was over here doing her coursework and thesis. And I enjoyed it very much, but I did miss the research, and I was pleased enough to come back here. Of course, because of my family life and because I had not been trained in meteorology I was not in a position to go on to the meteorology faculty or try to move ahead in any major way; that may be another reason why there was never any feeling of competition. There are few men, if any, who, having a background like mine, would have been willing to settle as a director of a not very big, but very interesting, project indefinitely until they retire. But it suited me, and it worked out well. In 1964, I was given an honorary degree, Doctor of Science, by Wilson College, and I think that was not entirely because of my scientific accomplishments, although I don't belittle them--I did good work, but it was also because I had combined the family life and the professional life. And it's true that at that time very few women did; it was unusual then.

LF: You mentioned the term "glass ceiling." Did you ever feel like you encountered that?

PA: No, that came after my day really.

LF: But I mean, that phenomenon, did you feel like you ever encountered that?

PA: Well, we did have a problem, but it was not because of my being a woman, but because I was not formally on the faculty. Our project was sponsored research: we had to write proposals or answer requests for proposals and things like that to obtain support for the project. In order to write or send a request for a proposal through the MIT office of sponsored research you had to have a faculty member sign as principal investigator. So I had to shanghai one of the faculty members to join with me, although the radar engineer and I were the ones who planned and supervised all the research. Finally, I don't remember just when it was, the chairman of the department thought that that was a little silly, so he did arrange it so that I, as a Senior Research Associate, could be the principal investigator and wouldn't have to call on anyone else to sign the proposal. So, that worked out very well. About then (it must've been in the 1960's sometime), affirmative action was getting to be quite the thing, and the chairman came back from a meeting with a dean and told me, "You know, Pauline, the dean says that a senior research associate is the equivalent of a full professor and that you are grossly underpaid." He added, "Can you afford to give yourself a raise?" because, of course, I had to find the money out of our project funds. I said, "No, but this is what we will do: we will give me a raise; I'll work the same amount; I'll collect the same amount, but we'll call it part time." By that time I was working full-time because my children were older and off to college. So it looked better on the books. At least MIT recognized the affirmative action problem, which was good because then the other people on the project could get a little bit more of a raise if the director had a raise.

I also became active in the American Meteorology society. The executive secretary of the Society was a good friend of mine and of my husband, and he used to ask me when I was going to join the American meteorological Society. I said, "When are you going to

have family membership?" But then, I finally did join and served on the radar committee and was the first woman to be elected to the Council. I enjoyed that very much and also helped to edit some of the journals.

LF: Did you feel any lack at all of not having a lot of female camaraderie in your work?

PA: No, not really. The men were congenial colleagues. As I said, my husband was in the same department so that the faculty and their wives were our friends.

My husband was a keen golfer, so I took it up (I'm not a very good golfer, but I'm an enthusiastic one). So we had friends over at the country club, and many of the women that I played golf with didn't even know that I came into MIT; some of them were surprised to learn that. And, of course, I had my daughters' connections--their friends and their friends' parents. We had a very pleasant social life in Concord.

LF: Did your daughters go on to study science?

PA: More or less. We kept telling them that if they would go to MIT we wouldn't have to pay tuition. Our elder daughter went to Wellesley, and she did actually major in astronomy. Then, she went on to work in various companies that do professional and technical services. She ended up with a company in Washington that was doing a lot of work for the Department of Defense. She's now with EPA; she does a lot of administrative work, but some technical work, too. Our other daughter went to Harvard and majored in Economics, and then went on to graduate work and is a Professor of Economics at the University of Florida in Gainesville.

LF: So, it's not as if they exactly inherited...?

PA: Well, as I say, nobody in my family was a scientist. I had never been exposed to it.

LF: So your father--did he do graduate work in math or did he just get a teaching degree in math?

PA: Well, I don't know. He graduated from the University of North Carolina and went to teach at Georgia Tech. Now, whether he took more courses there I am not sure, but he was an instructor there when he met my mother and they got married and went to Mexico.

LF: So how did your parents feel about every time when you decided that you wanted to move forward in your studies? Were they supportive? Did they think it was strange?

PA: They thought it was fine. As I said, they had no way of offering me support either financially or knowledgeably, but they were all for it. They were pleased that I was doing something that I really enjoyed, and I did truly enjoy it. When I came over and applied for the job, for the position in the Weather Radar Project, and they gave it to me, I could hardly believe that somebody would actually pay me to do what I most enjoyed doing. You see, that's why I'm still here--it's now my hobby.

LF: What exactly do you do your research on--what aspect of the weather?

PA: Well, right now, I am studying some of the data that was collected here that nobody had time to look at, comparing the radar measurements with rain-gauge data. Radar is very good for showing qualitatively what the storms are doing but poor for quantitative data. Thus I am still, and other people are still, doing some comparisons between the radar measurements and surface rain gauge measurements to see whether we can get more accurate rainfall amounts from the radar. As you can see when you see storms on TV, the

spatial variability is very great, so unless you had rain gauges every kilometer or two, you would never get the true distribution of rain. The radar gives the distribution, but it is not that good at giving the actual amounts. We originally took data on film because radar data come in so fast that there was no other way to record them. The radar samples a volume of space with a bunch of raindrops or snowflakes all moving around and produces a fluctuating signal. You not only have to average it, but you have to average each point along the ray with that same point on the next ray, without spatially smearing the points along the ray. That was a very difficult thing in the early days before we had computers that could handle it, because the radar pulses traveled out and back at the speed of light. In fact, meteorology in general, not just weather radar, has really pressed the computer state-of-the-art all along because of the complexity of the atmospheric phenomena. In the early 1970's (actually it was in 1974), there was an international project to study tropical convective showers because they are extremely important to the general circulation of the atmosphere. And a few years before that, they had a pilot project down in the Barbados, and I happened to see a report in one of the meteorological journals about the radar work that was done in that Barbados project. I was very distressed because I felt that it wasn't anywhere near the state-of-the-art, although we still didn't have digital measurements at that time. So, I got in touch with the people who were involved and I said, "Can we have something to do with analyzing the radar data from this new project?" Finally, after a lot of backing and forthing, the National Science Foundation asked if we would be interested in actually putting a radar on a ship that they had from the University of Miami in Florida and taking data in this project that was to be off the coast of Africa. That project gave us the big boost with respect to the funds and the pressure to get digital data. We felt that we needed to get the data on tape instead of on film. The film was just too difficult to analyze.

LF: Why did you have the pressure in this situation?

PA: Because we felt that we had to get digital data if we were going to find out what we wanted to find out about those tropical convective showers. You must realize that at that time computers and software that could handle weather radar data were not available. Our engineers, in conjunction with others working on quantitative radar data for the planned international project, called GATE, had to develop both hardware and software. The pressure was intense, to make sure we had it going by the summer of 1974. The other groups concerned with quantitative radar data were NOAA and McGill University. In this big international project they had ships from a number of countries and those from Germany and Russia had radars, but without digital data. Planes from different countries flew out from Senegal and took measurements over the ocean. It was the summer of 1974. For several years after that we were analyzing data from GATE and just beginning to take digital data here.

Thus when I retired in '79 or '80 (I don't remember which year it was exactly--I just sort of oozed out), I was just beginning to get my hands on digital data. And, I said, "No way, after looking at films for decades, am I going to walk away from numbers." So that's why I still keep on coming in and looking at data. The Weather Radar Lab is now closing down, but it went on until the early 1990's. After GATE much of the project work involved similar measurements in other parts of the world. But they still took local storm data whenever we had a good storm here. After I retired I started working on some of those storms. I just do enough to keep up with what's going on in the world of weather radar; I'm not contributing mightily to research or anything like that.

LF: One of the things I wanted to ask you was about your whole experience living in Mexico and coming here and then going back and then coming back here and then going around to all these different colleges. Do you believe that living in such a strange, isolated place helped you?

PA: Well, you know, when you're a child, you don't think of anything as strange, you just take for granted what you have. So I didn't think that there was anything that different about it, and I was well launched before I realized that it was unusual. When I was taking physics in college and people said, "What are you going to do with it? Are you going to teach?" I said I didn't really want to teach because, as I say, my people experience was limited, and I didn't feel that I would be good at teaching. I didn't know what I wanted to do, but I knew what I liked. So I just went ahead. That is what my husband used to tell his students here in Meteorology: You must find what you like because the world advances and you can't know now what good can come out of what you like, but you know that you'll enjoy it and do a good job. I realized that the sort of things that my friends down in Mexico and my brother (who became a doctor) were oriented towards were more religious and service-types of activities that did not appeal to me. So, I knew what I did not want to do better than I knew what I did want to do. And, my physics teacher at Wilson recognized this because she was the one who said: "MIT--that is the place for you to go," because she knew I would feel at home here and as if I belonged. And I did; it worked out well. I think in a way, the fact that I never went to school was probably helpful, because I wasn't exposed to what girls "are expected to do," and I didn't try to be a popular, dating sort of a person (in Mexico, you couldn't date anyway; it was not the custom). So, I just worked into things gradually, and by the time I was here at MIT, the studies took so much time that I didn't miss the fact that my social life was limited. So it worked out very well.

LF: But did you feel that the strange experience of moving from Mexico to Atlanta to go to school helped strengthen you to go on to college and further education?

PA: Well, I suppose so; I didn't really think about it. I was just pleased that my parents didn't send me to go off to school when I was twelve, the way they did my brother and sister, because I think that is very young. Since I had never had the experience of young

girls in school and in high school and dating and what they do, I was fortunate that we ended up living in a place like Concord with our two daughters. We had very congenial friends and they had good parents' groups and things like that. The girls went to the Scouts and other activities, and although I was working, I participated when I could. I brought cookies, or I drove people on trips on weekends and did what I could to support their activities. So there were good activities for young people, and the fact that I was not really knowledgeable on social things did not matter. And then the fact that we were interested in golf and ended up in the country club helped, too, with our social life. I don't know; I just sort of took things as they came and it worked out well.

LF: How do you think things have changed between when you started your career and now, for women in science?

PA: Now, it's much more accepted; if they have an interest they just go ahead. I did that a couple of generations before many women did; I didn't realize that I was really being so different, which, I suppose, was good because then I didn't worry about it. In a way, I have never been active in the women's movement but I figured I was just living it. And it was interesting because when I was here at MIT early on, there were very few girls in meteorology and most of those, sooner or later, crossed my path. The first woman to get a Doctor's degree in meteorology at MIT, a young woman from Argentina, was in dynamic meteorology (which is quite removed from my field), so I didn't have her in any courses; I just knew her to say hello in the halls. A number of years later I happened to meet her in the subway station at Harvard. I said, "Hello, how are you Eugenia." She said, "You know, Mrs. Austin, I always meant to tell you how much it meant to me that you were in the department at MIT because there was another woman." So, I guess I was doing some good just being there because it did show that a woman can do it, and there is nothing weird about it.

LF: Your mentor, Ms. Weeks, from Wilson college--how do you feel that she . . . ?

PA: She was a very energetic and active woman, and she was very active in the American Association of University Women, and she worked with their International Fellowships, so she helped a lot of young women from other countries come to this country to study. She was a very vigorous person.

LF: How do you feel she helped you specifically?

PA: Well, she encouraged me, mostly. She thought it was great that I wanted to do physics--that it was a good thing. She didn't say, "Oh, it's very difficult to get a job" and all that kind of stuff. She was active and enjoyed it and was a role model for me. Of course, she was not married, so she did not have to wangle family and other things. As I have said, that was what made me a little different from most other women at that time. Since then, of course, there has been more and more of it, but the world at large has not been too helpful about making it easy for people (especially women) to have a good professional life without spending so much time and energy on it that there is not enough left for family life. I don't know the answer to that, but I am sure it is a major question. I just don't understand why people, to get ahead, have to be so pressed, so competitive. There is much that needs doing, but people should be able to do it in a more leisurely way, cooperating, instead of competing all the time. So, I hope that sorts itself out a bit for modern young women. I think I have been very fortunate because I have had a very good life, I have a good family life and a satisfying professional one. My attitude has been simply: if a door of opportunity opens, you walk through it. You try to recognize what gives you satisfaction and do it. I wonder if many young people nowadays think more about whether they're going to get a good position and whether they're on the upward track

than whether they are doing something that they really want to spend their time and energy doing. The latter usually ends up bringing more satisfaction certainly and, usually, enough money, maybe not millions but enough.

LF: There is one thing I was really curious about. It seemed that you said to me that there was no big difference when you went to high school in Atlanta and when you had your aunt teaching you. You didn't feel very big differences between how she taught you and how you were taught in the regular schools?

PA: As children, we learned that we had to learn; we weren't just taught things. If you recognize that you are out to learn and your teachers are giving you guidance, it isn't such a big change from the one to the other. You will be interested to know that the only exam I ever flunked was Algebra. I studied it with my father at home when I was a freshman in high school. Math was my thing, and we just went through it; there were no difficulties. And I had never done any drill, or repeating, or going over, and so when I got to Atlanta and met the exam, I just sort of blanked out.

LF: You just didn't remember the things you were supposed to?

PA: No, I didn't really remember; I had understood it, originally. But I didn't do a good job on the exam. My cousin, principal of the school, said to the math teacher, "What are we going to do about this--about the algebra exam?" Then, she said, "Why don't you just take her in the second year math course (which was geometry, what that has to do with algebra, I don't know), and see how she does?" Well, of course, as I say, math was my thing, and I became the star of the class, and everything was fine. I never really missed the algebra. It wasn't that I couldn't do it; it was just that I had never taken any exams. I took exams in other subjects--Latin, history, and in the other things I had studied at home, but

they didn't desert me the way the algebra did. I was very naive, too, about higher education. I didn't really know anything about different colleges and universities and the business of choosing a college. Of course, I had heard about Harvard and the colleges my sister and brother attended, but that was about all. I didn't even realize, until after I had my degree from MIT, the amount of prestige it gives. So, I went through this whole educational process sort of unconscious about what I was aiming for. I was just absorbing things that interested me. I arrived at MIT with a Master's degree in physics from Smith College, but when the registration officer in the physics department looked at my transcript, he said, "You have so many undergraduate deficiencies; I don't think we'll ever get you into a graduate course." As you can imagine, a small college for women like Wilson had little to offer in math and physics, and I had just the one year at Smith. Then, he said, "Well, if you'll take Professor Harrison's course in Experimental Physics, we'll wipe off some of the others." He added, "Of course, no girl has passed that course yet." So, I took it; no great problems arose until Professor Harrison gave us one of Professor Edgerton's stereoscopic pictures, the one of the man hitting the golf ball, where it has the club in the various positions and the ball going away. The problem was to discuss the transfer of energy from the man to the club to the ball; well, I had never seen a golf club, nor held a golf ball. There wasn't a dorm for women here at that time; I had a room in an apartment near Central Square. I thought when I got here, that I must be getting to the North Pole, having come from Mexico to Atlanta to Pennsylvania to Massachusetts. The couple that had the apartment were actually students who rented this large apartment, and took in roomers to make ends meet. It turned out, of all the people in that apartment, I was the one that was nearest home. The host couple were from Oregon, and if you draw a great circle from here to there, it's farther than Mexico City. And there was a young man from Panama. There was a Chinese student, and there was my husband-to-be (whom I had not yet met) from New Zealand. To get back to the problem, I went to my landlady, who, being a girl about my own age, had soon become a friend, and said, "Do you know

anything about golf? Here's this problem: I can figure the man is about six feet high; I have the timing: the photos are a hundredth of a second apart, but I don't know what anything weighs; I have no idea what the mass of a golf ball is." "Well," she says, "I don't either, but I saw some golf clubs in Mr. Austin's closet." So, I knocked on Mr. Austin's door, and explained the problem. "Oh," he said (fresh from New Zealand, with an accent), "I don't rightly know what the mass of a golf ball is, why don't we weigh it?" I failed to understand the accent, retired in confusion, and flunked the problem, but we later met in a more sociable way. And many years later Jim was telling that story to Professor Edgerton, and he presented him with an autographed copy of that famous picture.

LF: So, once you took that class, even though the officer said you had deficiencies in other..."

PA: Well, my background was not at all what students get at MIT. They weight them pretty heavily, you know. They had to take physics, chemistry, and math freshman year and also sophomore year, and then start branching off into other things. But I didn't have any serious problems. Actually, I thought I was flunking everything all the time anyway because at Wilson, if a teacher gave you an assignment, they expected you to do it. Here, they have to give their assignments to challenge people who really are geniuses, but I expected I had to do them anyway, and was not always able to. So, of course, I was always struggling and struggling, and it turned out I was making perfectly good grades all along; there was no real problem.

LF: Did you find that frustrating, or did you brush it off pretty easily?

PA: Oh, no, as I say, Professor Vallarta put me into an office with some of his graduate students, so I got to know people who would help me and talk to me, and they were very

helpful. Other students would explain things that I didn't understand, so I caught on, slowly. It was very difficult to be here, that's true, but it was worthwhile, and I really liked it. When we were talking about getting married, I was very hesitant because, in those days, it was expected that a woman would just be the housewife. I didn't really want to just be a housewife because I was interested in what I was doing and I wanted to proceed ahead. But my husband-to-be recognized that. At that time, he expected to go back to New Zealand, to the New Zealand Meteorological Service, but I figured that wherever we went, having the background I had, as long as I stayed to finish my degree, I would be able to find something useful and interesting to do. When it turned out that they put him on the faculty here, of course that was, to my mind, great, and it worked out wonderfully. He stayed here, too, until he retired.

LF: So he was of the mind that it didn't bother him that you would want to pursue your career?

PA: No, not really. At that time, in New Zealand, many girls did not even go to college. It wasn't a very usual thing. He said, "I never thought I'd be marrying a university girl, and here I am with a graduate student!" He recognized what I wanted to do, and he did not expect me to just be at home. So, it worked out very well. Also, in those days, it was not so difficult to get baby-sitters and a person to work in the home for you. Now, I think it is more difficult.

LF: So you'd stay at home half the day and work the other half of the day?

PA: Well, we lived right across the street from MIT, in Bexley Hall, when we were first married. When our first baby was born, I was already working in the Radiation Lab, and I arranged with them that I could bring work home part of the time. There was an older

woman who lived in one of the apartments over there, and I could leave the baby with her sometimes. And there was another apartment that housed four MIT coeds, and they were available for sitting sometimes, so I didn't have too much trouble. One was not supposed to take Radiation Lab work out of the lab, but we were able to arrange that. When Doris was about ten months old, we moved out to Concord. My husband was about to go overseas then as a consultant for the Air Force. He was not in the army because he was teaching courses here. I was concerned because we rented a little place out there, and as it was during the war, it took forever, if ever, to get a telephone installed, and if I was going to be by myself with the baby I wasn't happy about that. So I told my supervisor at the Red Lab, and he said, "Oh, we'll take care of that." He called the phone company and told them that I was working with the Radiation Lab, and it was essential that they be able to get in touch with me. My husband was away then, and I said, "There's nobody at home but me and the baby, so anything I take home is not going to be seen by anyone." I came in for a conference a couple of times a week and was able to get a woman out there to leave the baby with. And it worked out all right. Later on, the children went to school. I would go home in the middle of the afternoon, and by the time they got home from school, I would be there. I had a woman who cleaned and looked after the girls if they got home from school before I got home from here. So, I did have household help. The girls would often have after-school activities. I'd go home on the 2:30 train, and I'd be home almost as soon as they were. When the first one got home, I'd sit down and have a cup of tea with her because you know if you say, "What did you do at school today," they say, "Oh, nothing." So, I'd sit down and have a cup of tea and we'd start chatting, and then the next one would come in and I'd sit down and have a cup of tea with her and we'd start chatting. My husband would finally come home, and we'd sit down and have a cup of tea. That's one of the New Zealand habits that hangs on. My younger daughter went to Radcliffe; she said, "Oh, my friends were astonished at the way I was always going around drinking a cup of tea." I was able to work half-time and able to fit it in comfortably. By the time I

was trying to direct the project, they were well along in school, and time was more available. When we first started the Radar Lab, we couldn't leave the radar going on its own. Somebody had to be there and change the films and such. If there was a big storm going on, we had to have somebody around the clock. I surprised my colleagues because I always chose to have the graveyard shift, from 11 p.m. to 5 or 6 a.m. because I could go home, feed the family dinner, get the girls to bed, come in and do my stint, go back, feed them breakfast, send them to school, and crawl into bed myself. It worked out very well. It's just a matter of being adjustable.

LF: Well, you're pretty adjustable, in changing between all those different jobs.

PA: That's what I mean. I think employers should be more adjustable, too, particularly toward women. Now, there's more and more talk about flexible hours and sharing jobs and things like that--which is a very sensible thing. People can have a good professional life without killing themselves over it--in my opinion anyway.

LF: Do you have anything else to add?

PA: I always enjoyed a good relationship with people in the radar area and in meteorology as a whole. Because Weather Radar was a new field and we were all pioneers feeling our way, there was a great sense of camaraderie. People did not really care whether you were male or female as long as you were interested in doing your job and getting on with the act. So it has been nice in that respect.